

NASA TECH BRIEF

Marshall Space Flight Center



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Novel Dielectric Reduces Corona Breakdown in AC Capacitors

The problem:

A dielectric system was required that would reduce corona breakdown in ac capacitors.

The solution:

A dielectric system was developed which consists of two layers of 25-gage paper separated by one layer of 50-gage polypropylene.

How it's done:

The predominant problem in ac capacitors is corona breakdown, which is experienced when capacitors are operated above approximately 250 V rms. Corona is defined as an electrical discharge occurring as a result of ionizing a gas, with the resultant energy destroying the dielectric material directly or indirectly by the creation of ozone in the system. Previous dielectric systems utilized impregnated paper or pure plastic systems which are 3 to 4 times the size of the recently developed system. Design criteria dictated that the part not be over 6.35 cm (2.50 in.) in diameter nor more than 6.35 cm (2.50 in.) high with an additional 1.26 cm (0.50 in.) for terminals. The rating of the part was 3 μ F at 400 V rms, 400-Hz with a maximum dissipation factor of 0.33%. The dielectric system developed utilizes two layers of 25-gage paper separated by one layer of 50-gage polypropylene. The paper is impregnated with mineral oil. Impregnated paper systems typically have a dissipation factor which can approach 1%. Normally, they vary from 0.3 to 0.5%. Polypropylene has a dissipation factor of 0.03%. The 50-gage properly impregnated polypropylene can be operated above 600 V-rms. While the impregnated paper adds to the alternating current dielectric properties, the main reason for its use is to wick the impregnant into the system to exclude any gases which are present.

The part can be used in any alternating current application where the constant voltage does not exceed

400 V rms. It is felt that with a little research, the system could be operated at 700 to 800 V-rms. The system operation is dependent on the use of either a carbon-free mineral oil or the askarels. Although composite dielectric systems have received widespread attention in the past, the system described in this disclosure appears novel due to the design configuration. The innovation may be useful in a variety of applications other than capacitors. For example, the composite materials used to form the capacitors may also be used to fabricate high voltage cable and transformer insulation.

Notes:

1. Information concerning this innovation may be of interest to the designers and manufacturers of inductive or capacitive electrical components.
2. Specific questions concerning this innovation may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
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Reference: B72-10505

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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